65373 U.S. PTO
02/24/97

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Chin Hsien KOU

Docket: 9751.46US01

Title: HEAT SINK HAVING AN ASSEMBLING DEVICE

CERTIFICATE UNDER 37 CFR 1.10
'Express Mail' mailing label number: EM531690525US
Date of Deposit: February 24,1997
I hereby certify that this paper or fee is being deposited with the United States Postal Service 'Express Mail Post Office To Addressee' service under 37 CFR 1.10 and is addressed to the Assistant Commissioner for Patents, Washington, D.C 20231.

By: _____
Name: Darrell Whitaker

BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

We are transmitting herewith the attached:

- ☒ Transmittal sheet, in duplicate, containing Certificate under 37 CFR 1.10.
- ☒ Utility Patent Application: Spec. 16 pgs; 3 claims; Abstract 1 pgs.
  The fee has been calculated as shown below in the 'Claims as Filed' table.
- ☒ 4 sheets of formal drawings
- ☒ Verified statement to establish small entity status
- ☒ A signed Combined Declaration and Power of Attorney
- ☒ Assignment of the invention to Silicon Integrated Systems Corp,, Recordation Form Cover Sheet
- ☒ A check in the amount of $385.00 to cover the Filing Fee
- ☒ A check for $40.00 to cover the Assignment Recording Fee.
- ☒ Return postcard

CLAIMS AS FILED

Number of Claims Filed		In Excess of:		Number Extra		Rate		Fee
Basic Filing Fee								$385.00
Total Claims								
3		20		0		0.00	=	$0.00
Independent Claims								
2		3		0		0.00	=	$0.00
MULTIPLE DEPENDENT CLAIM FEE								$0.00
TOTAL FILING FEE								$385.00

Please charge any additional fees or credit overpayment to Deposit Account No. 13-2725. A duplicate of this sheet is enclosed.

By: _____
Name: Michael D. Schumann
Reg. No.: 30,422
Initials: MDS/dnb

MERCHANT, GOULD, SMITH, EDELL,
WELTER & SCHMIDT
3100 Norwest Center, Minneapolis, MN 55402
(612) 332-5300

HEAT SINK HAVING AN ASSEMBLING DEVICE

BACKGROUND OF INVENTION

This invention relates to a heat sink for used in computer, particularly to a heat sink having an assembling device.

The chips currently used by motherboards generate inevitable high temperature during operation thereby affecting the life term thereof. The industry already developed heat sinks disposed over the chips by means of certain structure so as to effectively eliminate and dissipate heat generated thereby in view of such a problem.

Accompanied with the implementation of heat sinks, the industry has developed various methods for fastening heat sinks onto the chips, such as by adhesive or by various clamping assemblies. These conventional methods are, however, hardly accepted by manufactures. For example, while using adhesive for fastening heat sinks, the heat sinks frequently peel off during transportation due to failure of adhesive. While using conventional clamping structure, the chips are easily damaged due to structural defects of clamping members resulting from maintenance or disassembling processes.

The present invention resolves such bottlenecks confronted by conventional fastening or resilient fastening structure.

BRIEF DESCRIPTION OF INVENTION

One objective of the invention is to provide a heat sink having an assembling device which steadfastly fastens a conventional heat sink onto a chip in a simple manner by means of simple mechanical concepts of resilience and flexibility.

According to an embodiment of the invention, a heat sink having an assembling device comprises a chassis having a heat dissipating surface, a plurality of fastening holes formed on the chassis, and fastening bolts as well as helical springs corresponding to the fastening holes, wherein the fastening bolts each further comprise a fungus-shaped insertion end.

According to another embodiment of the invention, a heat sink having an assembling device comprises a chassis having a heat dissipating surface and a fastening seat for fastening the heat sink.

More particularly, the fastening seat is formed of a resiliently deformable and integrally formed hollow sheet and is provided with a pair of hooks each having a V-shaped barb for inserting the chassis into a hole,

that is pre-formed on a motherboard and abuts a chip, and for resiliently pressing the heat sink against the chip.

Not only does the structure provided by the embodiments as described in the invention allow the heat sinks to be easily assembled and efficiently disassembled, but also prevent the chips from damages.

The foregoing and other technical contents of the invention can be further realized with the drawings and detailed explanations of the embodiments.

BRIEF DESCRIPTION OF DRAWING

Fig. 1 illustrates a perspective view of an embodiment of the invention under state of use;

Fig. 2 is an exploded structural schematic view of Fig. 1;

Fig. 3 is a schematic view illustrating the structure of Fig. 1 being inserted in and fastened to a motherboard;

Fig. 4 illustrates a perspective view of another embodiment of the invention under state of use;

Fig. 5 is an exploded structural schematic view of Fig. 1;

Fig. 6 is an enlarged view of the hook structure of Fig. 5; and

Fig. 7 a schematic view illustrating the structure of Fig. 4 being inserted in and fastened to a motherboard.

LIST OF SYMBOLS

20	heat sink	30	fastening bolt
202	chassis	302	heat portion
204	chassis edge	304	bolt body
206	fastening end	306	insertion end
208	fastening hole	346	open hole
40	helical spring		
50	fastening seat	20′	heat sink
500	outer rim	202′	chassis
521	first section	204′	chassis edge
522	second section		
523	third section	C	chip
524	forth section	E	motherboard
560	hookHhole	562	barbH′hole

564 contact surface

R heat dissipating surface

566 apex

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Figs. 1 and 2 illustrate an embodiment of a heat sink having an assembly device according to the invention under state of being used on a motherboard E, disclosed in which is a heat sink 20 for disposing over a chip C of the motherboard E. The heat sink 20 substantially comprises a chassis 202, fastening bolts 30, and helical springs 40.

As illustrated in Fig. 2, the chassis 202 is a flat sheet (generally rectangular) having a shape and dimension substantially identical to those of the chip C, on which chassis is formed with a plurality of heat dissipating fins so as to form a heat dissipating surface R. The planar surface between the outer most edge of the chassis 202 and the heat dissipating surface R delineates a chassis edge 204. The chassis 202 of the heat sink 20 is provided with fastening ends 206 laterally extending from the chassis edge 204. Such fastening ends do not require any specific shape or quantity and are preferred to extend from diagonal corners of the chassis edge 204 in a pair. Each

fastening end is formed with a fastening hole 208 having a first diameter thereon.

Each set of fastening holes 208 further adapt to fastening bolts 30 and helical springs 40 thereby forming structure for fastening the heat sink 20. As illustrated in Fig. 2, the fastening bolt 30 is substantially in a columnar configuration, the structure of which includes a head portion 302, a bolt body 30, and an insertion end 306. The head portion 302 located on top of the fastening bolt 30 has a large cross-sectional area as compared with that of the fastening bolt 30 body. The bolt body 304 is a substantially cylindrical body having a second diameter and locating beneath the head portion 302, one end of the which bolt body is connected to the heat portion 302 and the other end extends downwardly and connects to the insertion end 306. The second diameter of the bolt body 302 is substantially smaller than or identical with the first diameter. The insertion end 306 is substantially similar to an inversely frustum fungus and gradually converges and extends from the bolt body thereby forming a cylindrical frustum configuration. The cross-section of the junction where the insertion end 306 and the bolt body 304 joins is a circular one having a third diameter. The third diameter is larger than the first diameter of the

fastening hole 208 and the second diameter of the bolt body 304. Furthermore, the fastening bolt 30 is preferably formed with a narrow opening 346 laterally penetrating the insertion end 306 and extending into a portion of the bolt body 304 thereby providing compressive resiliency in the radial direction.

As illustrated in Figs. 1 and 2, the helical spring 40 is telescopically provided over the bolt body 304 of the fastening bolt 30. The helical spring 40 has a forth diameter larger than the first diameter of the fastening hole 208. The cross-sectional area formed by the helical spring 40 is smaller than that of the head portion 302 of the fastening bolt 30. Therefore, one end of the helical spring 40 urges against the head portion 302 and the other end against the peripheral planar surface of the fastening bolt 208 after assembly of the helical spring 40.

As illustrated in Fig. 2, in operation the motherboard E is formed with penetrated holes H thereon at locations corresponding to the fastening holes 208. The holes H are so dimensioned as to be substantially the same as the fastening holes 208 for compressively clamping the insertion ends 306 of the fastening bolts 30 therein. As illustrated in Figs. 2 and 3, in operation the chassis 202 is initially placed over a

surface of the chip C, the fastening bolts 30 then in term insert through the helical springs 40 and fastening holes 208, and finally insert and clamp into the holes H formed on the motherboard E.

When the insertion end 306 of the fastening bolt 30 inserts into the hole H, the narrow opening 346 formed on the insertion end 306 of the fastening bolt 30 subjects the insertion end 306 to respond to the lateral pressure imparted to the insertion end 306 by the motherboard E thereby facilitating insertion of the fastening bolt into the hole H. Finally, collaboration between resiliency of the helical spring 40 and the shape of fastening bolt 30, the heat sink 20 can resiliently press against the chip C thereby enhancing heat transfer effect and adapting to chips of various thickness.

Figs. 4 and 5 illustrate another embodiment according to the invention under state of being used on a motherboard E. As illustrated in the figures, a heat sink 20′ is disposed over a chip C on the motherboard E. The heat sink 20′ substantially comprises a chassis 202′ and a fastening seat 50.

As illustrated in Fig. 5, the chassis 202′ is a flat sheet having a shape and dimension substantially identical to those of the chip C, on which chassis is

formed with a plurality of heat dissipating fins so as to form a heat dissipating surface R. The planar surface between the outer most edge of the chassis 202' and the heat dissipating surface R delineates a chassis edge 204'.

The fastening seat 50 is formed by a resiliently curvable and integrally formed hollow sheet, and is preferably formed of a metal sheet. It is shown in the figures that the fastening seat 50 mainly comprises an outer rim 500 and hook portions 560.

As illustrated in the figures, the shape and dimension of the outer rim 500 are substantially the same as those of the chassis edge 204'. The outer rim 500 is also telescopically provided over the chassis edge 204'. Though the outer rim 500 is an integrally formed sheet, it is further distinguished into a first section 521, a second section 522, a third section 523 and a forth section 524 which are sequentially connected, for the ease of explanation. More particularly, the shape and dimension of the first and third sections 521, 523 are completely identical to and disposed symmetrically about each other; the second and forth sections 522, 523 are also completely identical to and disposed symmetrically about each other, wherein the first and third sections 521, 523 extend

horizontally and the second and forth sections 522, 524 incline upwardly and outwardly.

There are two hooks 560, each of which extends outwardly and rearwardly from center of the second and forth sections 522, 524, respectively, to form a downwardly extended L-shaped configuration.

Particularly, each hook 560 downwardly extends and connects to a V-shaped barb 562. The apex 566 of the V-shaped barb 562 extends toward the chip C, and the lower portion of each V-shaped barb 552 defines a contact surface 564. The shape of the barb 561 is preferably as shown in Fig. 6.

A pair of holes H' can be pre-formed on the motherboard E. The locations of the holes H' subject the contact surface 564 of the barbs 562 of the fastening seat 50 to contact with sides of the holes H' abutting the chip C'.

Fig. 7 is a structural illustration of Fig. 4 illustrating the state of the heat sink 20' being steadfastly fastened onto the motherboard E by means of the fastening seat 50. In view of Figs. 4 and 7, after the barbs 562 of the fastening seat 50 are inserted into the holes H', the second and forth sections 522, 524 originally inclined upwardly and outwardly are each

pressed against the chassis edge 204' of the heat sink 20' such that the heat sink 20' can be resiliently and tightly pressed against the chip C thereby enhancing heat transfer effect and adapting to chips of various thickness.

Foregoing embodiments of the invention ingeniously implement simple mechanical concepts of resilience and flexibility to a heat sink having an assembling device so as to achieve their intended functions. It should be appreciated that only trivial pressure is required to be imparted on the foregoing structure so as to subject the overall heat dissipating device being assembled to a designated location during assembly and that only trivial force is required to be imparted on the fastening bolts or fastening seat underneath the motherboard so as to release the foregoing structure during disassembly, thereby allowing the heat sinks being efficiently assembled and disassembled and steadfastly fastened without damaging the chip.

The invention can also be realized by other specific embodiments without departing from the concepts and essential features thereof. Therefore, all embodiments expounded in the foregoing descriptions are illustrative but not limited in any domain. All modifications complying with the concepts and scope of

the claims or other equivalence are contemplated by the realm of the invention.

What is claimed is:

1. A heat sink having an assembly device adapting to a hole formed on a motherboard and being assembled over a chip for dissipating energy generated by said chip to exterior, said heat sink comprises:

a chassis having a configuration and dimension substantially identical with the shape of said chip, a plurality of fins formed thereon constructing a heat dissipating surface, and a planar chassis edge defined by a planar surface between an outer most edge thereof and said heat dissipating surface, said chassis further having a plurality of fastening ends extending from said chassis edge, each of which fastening ends being formed with a fastening hole having a first diameter;

a plurality of fastening bolts of a same quantity as said fastening holes, each fastening holes being substantially in a columnar configuration and having a head portion, a bolt body, and an insertion end from the top down, wherein said fastening bolt can penetrate through said fastening holes of said fastening ends, said bolt body is telescopically provided with a helical spring, and said insertion end is adapted to be clamped into said holes formed on said motherboard subjecting said helical spring urging against said fastening ends;

whereby said heat sink is resiliently pressed against said chip by means of urging said fastening seat and said helical spring against said chassis as well as clamping said fastening bolts into said holes formed on said motherboard.

2. A heat sink having an assembly device according to claim 1, wherein said fastening bolts are each formed with a narrow opening penetrating from a furthermost end of said insertion end and extends into a portion of said bolt body.

3. A heat sink having an assembly device adapting to a hole formed on a motherboard and being assembled over a chip for dissipating energy generated by said chip to exterior, said heat sink comprises,

a chassis having a configuration and dimension substantially identical with the shape of said chip, a plurality of fins formed thereon constructing a heat dissipating surface, and a planar chassis edge defined by a planar surface between an outer most edge thereof and said heat dissipating surface;

a fastening seat formed by a resiliently curvable and integrally formed hollow sheet, said fastening seat comprising:

an outer rim being so shaped and dimensioned as to be consistent with those of said chassis edge and to allow said outer rim being telescopically provided over said chassis edge, said outer rim being distinguished into a first section, a second section, a third section, and a forth section which are sequentially connected, wherein the shape and dimension of said first and third sections are consistent with and disposed symmetrically about each other; and those of said second and forth sections are consistent with and disposed symmetrically about each other, said first and third sections extend horizontally, and said second and forth sections incline upwardly and outwardly;

wherein an L-shaped and downward-suspended hook extends outwardly from center of each said second and forth sections, the shape and dimension of said hooks are consistent with and disposed symmetrically about each other, and said downward-suspended ends of said hooks each comprise a V-shaped barb, an apex of said V-shaped barb converges toward said chip, a lower surface of said V-shaped barb defines a contact surface adapted to be clamped into said holes formed on said motherboard whereby said first and third sections are pressed against said chassis edge by means of resilience of said second and forth sections.

HEAT SINK HAVING AN ASSEMBLING DEVICE

ABSTRACT

A heat sink having an assembling device using mechanical characteristics of resilience or flexibility so as to obtain the effectiveness of fastening a heat sink. In an embodiment, this invention comprises a chassis having a heat dissipating surface, a plurality of fastening holes formed on the chassis, and fastening bolts and helical springs corresponding to the fastening holes, wherein the fastening bolts each further comprise a fungus-shaped insertion end. In another embodiment, the heat sink comprises a chassis having a heat dissipating surface and a fastening seat for fastening the heat sink, wherein the fastening seat is formed of a resiliently curvable and integrally formed sheet and is provided with a pair of hooks each having a V-shaped barb for inserting the invention into holes abutting the chip and pre-formed on a motherboard and for resiliently pressing the heat sink against the chip.

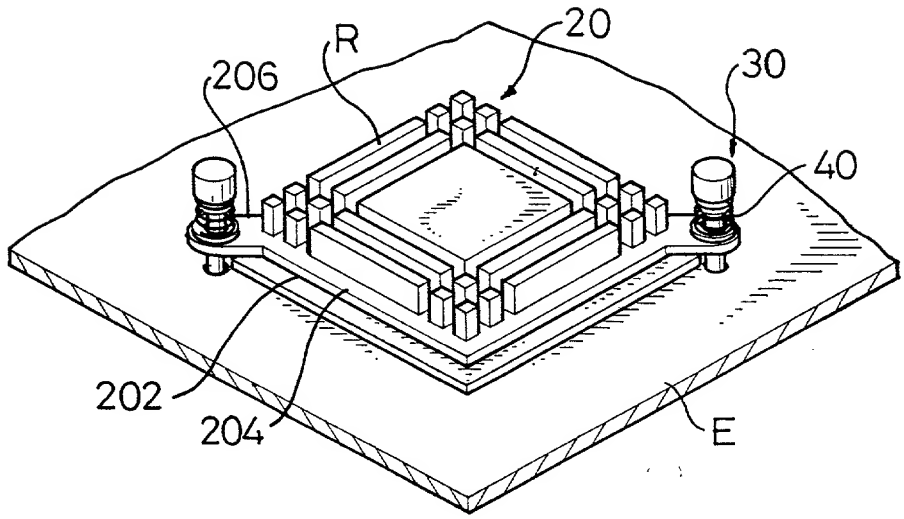

FIG. 1

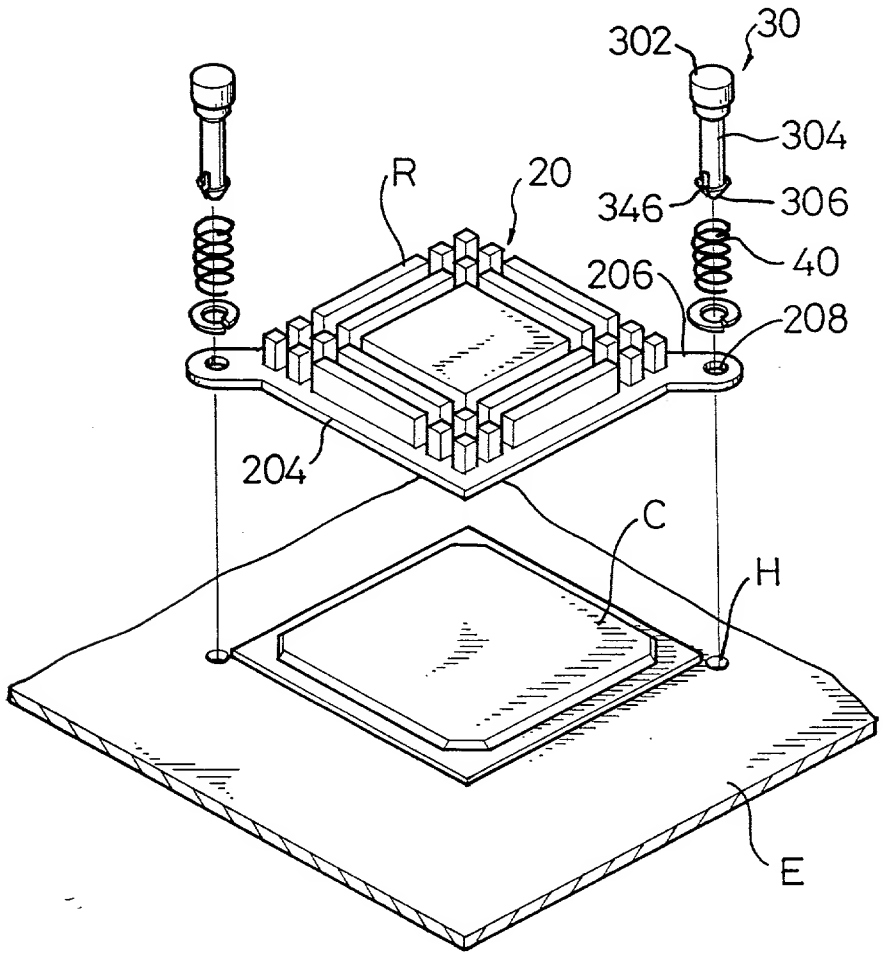

FIG. 2

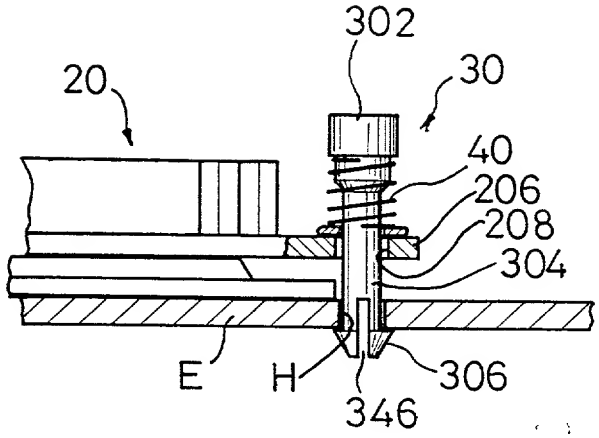

FIG. 3

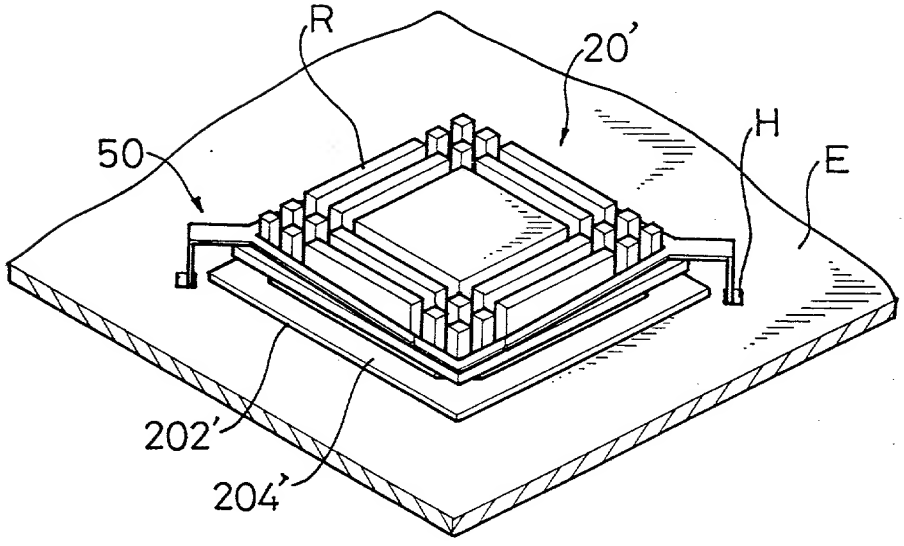

FIG. 4

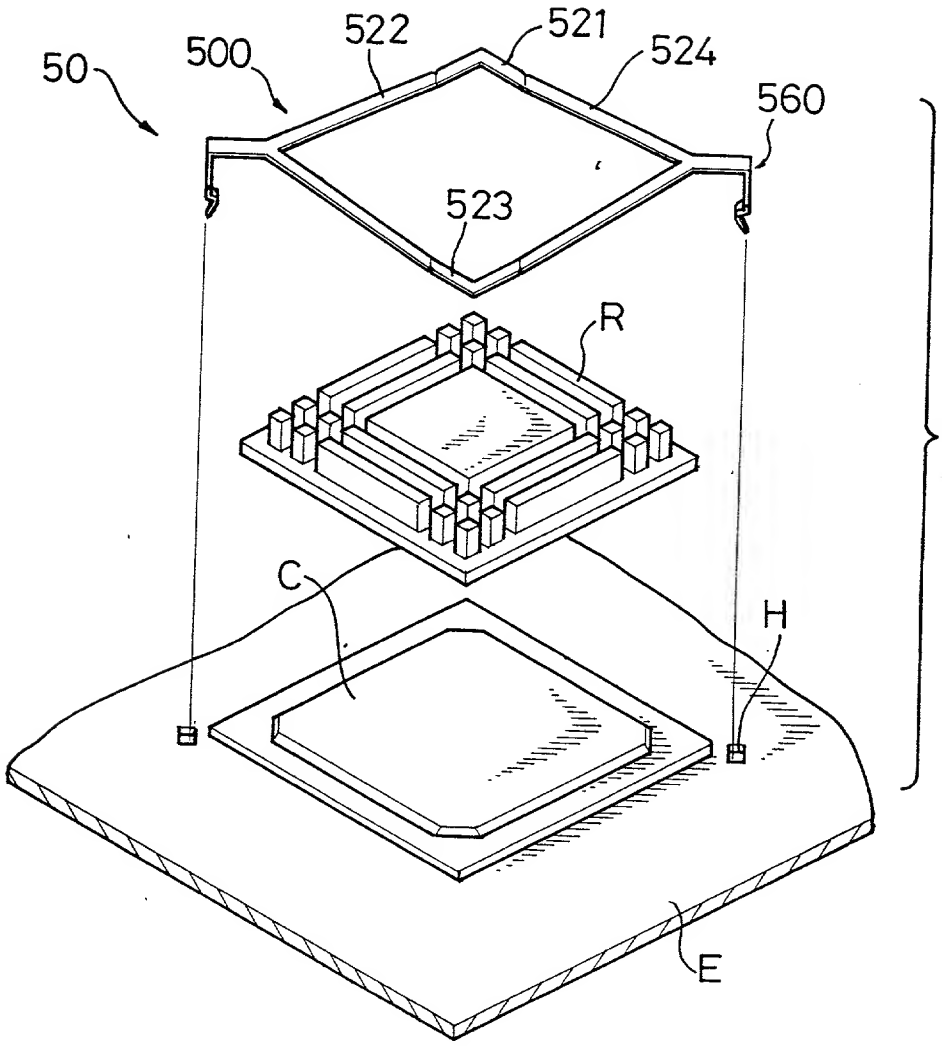

FIG. 5

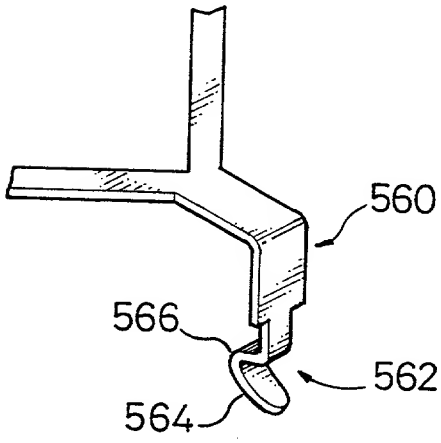

FIG. 6

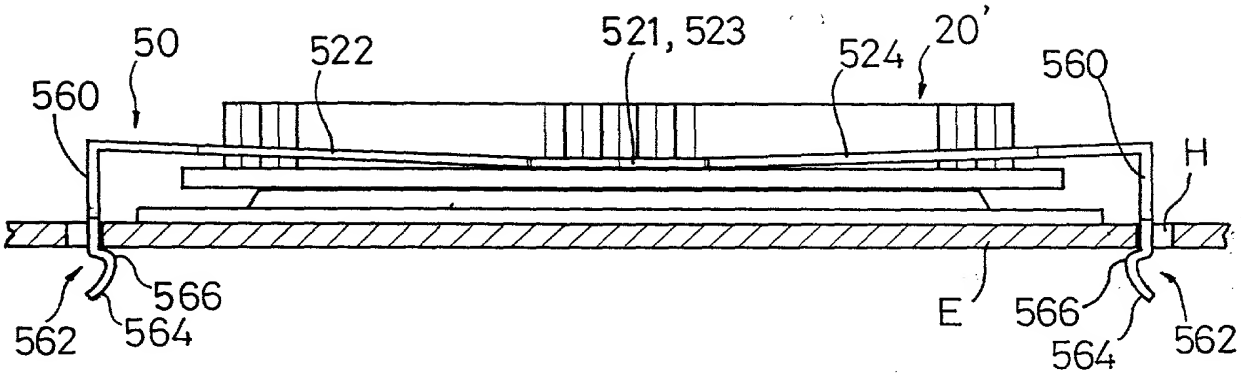

FIG.7

▼INSTRUCTIONS

SMALL BUSINESS

04-1402

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) AND 1.27(c)) - SMALL BUSINESS CONCERN

I hereby declare that I am

Check one ➤
a) ( ) the owner of the small business concern identified below:
b) (x) an official of the small business concern empowered to act on behalf of the concern identified below:

Insert company name and address ➤
NAME OF CONCERN: SILICON INTEGRATED SYSTEMS CORP.
ADDRESS OF CONCERN: 2F, NO. 17, INNOVATION ROAD I, SCIENCE-BASED INDUSTRIAL PARK, HSINCHU, TAIWAN, R.O.C.

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.12, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

Insert title of application, inventor's names ➤
I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled "HEAT SINK HAVING AN ASSEMBLING DEVICE" by inventor(s) KOU CHIH HSIEN described in

Check one, fill in if b) or c) ➤
a) (x) the specification filed herewith.
b) ( ) application serial no. _____, filed _____.
c) ( ) patent no. _____, issued _____.

If the rights held by the above-identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who could not qualify as an independent inventor under 37 CFR 1.9(c), if that person had made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e). *NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

Insert co-owners, if any, and check a), b) or c) ➤
NAME _____
ADDRESS _____
a) ( ) INDIVIDUAL b) ( ) SMALL BUSINESS CONCERN c) ( ) NONPROFIT ORGANIZATION

NAME _____
ADDRESS _____
a) ( ) INDIVIDUAL b) ( ) SMALL BUSINESS CONCERN c) ( ) NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereof, or any patent to which this verified statement is directed.

Insert ➤
NAME Sheau-Ming Samuel Liu
TITLE President
ADDRESS No.16, Creation Rd.1, Science-Based Industrial Park, Hsinchu Taiwan

Sign. date ➤
SIGNATURE _____ DATE February 5, 1997

For Utility, PCT, and Design Applications

US-1492

MERCHANT & GOULD

United States Patent Application

COMBINED DECLARATION AND POWER OF ATTORNEY

▼ INSTRUCTIONS

As a below named inventor I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that

I verily believe I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Insert TITLE of invention

"HEAT SINK HAVING AN ASSEMBLING DEVICE"

Check a or b

The specification of which

a. ☒ is attached hereto

b. ☐ was filed on _____

If "b" checked, complete

as application serial no. _____

and was amended on _____ (if applicable)

If PCT Application

Insert Int. application number & filing date

(in the case of PCT-filed application)

described and claimed in international no. _____ filed _____

and as amended on _____ (if any), which I have reviewed and for which I solicit a United States patent.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a). (Reprinted on back side).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119/365 of any foreign application(s) for patent of inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on the basis of which priority is claimed:

Prior applications
Check a or b

a. ☒ no such applications have been filed.

b. ☐ such applications have been filed as follows:

If "b" checked, complete

FOREIGN APPLICATION(S), IF ANY, CLAIMING PRIORITY UNDER 35 USC § 119			
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)
ALL FOREIGN APPLICATIONS, IF ANY, FILED BEFORE THE PRIORITY APPLICATION(S)			
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)

I hereby claim the benefit under Title 35, United States Code, § 120/365 of any United States and PCT international application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

Revised 12/09/94

For Continuation-in-Part (CIP) Applications, complete

U.S. APPLICATION NUMBER	DATE OF FILING (day, month, year)	STATUS (patented, pending, abandoned)

I hereby appoint the following attorney(s) and/or patent agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith:

Adriano, Sarah B	Reg No 34,470	Gabilan, Mary Susan	Reg. No. P-38,729	Plunkett, Theodore	Reg. No. 37,209
Batzli, Brian H	Reg No. 32,960	Gates, George H	Reg. No. 33,500	Pollinger, Steven J.	Reg. No. 35,326
Beard, John L	Reg. No. 27,612	Golla, Charles E.	Reg. No. 26,896	Reich, John C.	Reg. No. 37,703
Beck, Robert C	Reg No. 28,184	Gorman, Alan G.	Reg No. P-38,472	Reiland, Earl D.	Reg. No. 25,767
Bejin, Thomas E	Reg No. 37,089	Gould, John D	Reg. No. 18,223	Schmidt, Cecil C.	Reg. No. 20,566
Berman, Charles	Reg No 29,249	Gresens, John J.	Reg. No. 33,112	Schuman, Mark D.	Reg. No. 31,197
Bogucki, Raymond A	Reg No. 17,426	Hamre, Curtis B	Reg. No. 29,165	Schumann, Michael D.	Reg. No. 30,422
Bruess, Steven C	Reg. No 34,130	Hassing, Thomas A.	Reg. No. 36,159	Sebald, Gregory A.	Reg. No. 33,280
Byrne, Linda M	Reg No 32,404	Hillson, Randall A.	Reg. No 31,838	Sharp, Janice A.	Reg. No. 34,051
Carlson, Alan G	Reg. No. 25,959	Hollingsworth, Mark A.	Reg. No 38,491	Smith, Jerome R.	Reg. No. 35,684
Carter, Charles G	Reg No 35,093	Kastelic, Joseph M	Reg. No. 37,160	Sorensen, Andrew D.	Reg. No. 33,606
Caspers, Philip P	Reg. No 33,227	Kowalchyk, Alan W.	Reg. No. 31,535	Stinebruner, Scott A.	Reg. No. 38,323
Clifford, John A	Reg No 30,247	Kowalchyk,Katherine M.	Reg. No 36,848	Strawbridge, Douglas A.	Reg. No. 28,376
Conrad, Timothy R	Reg No 30,164	Krull, Mark A	Reg. No 34,205	Strodthoff, Kristine M.	Reg. No. 34,259
Crawford, Robert	Reg No 32,122	Lacy, Paul A	Reg. No. P-38,946	Sumner, John P.	Reg. No. 29,114
Daignault, Ronald A	Reg No 25,968	Lasky, Michael B.	Reg No 29,555	Sumners, John S.	Reg. No. 24,216
Daley, Dennis R	Reg. No 34,994	Lynch, David W.	Reg. No 36,204	Tellekson, David K.	Reg. No. 32,314
Daulton, Julie R	Reg No 36,414	Mau, Michael L.	Reg. No 30,087	Underhill, Albert L.	Reg. No. 27,403
Dempster, Shawn B	Reg No 34,321	McDonald, Daniel W.	Reg No. 32,044	Vandenburgh, J. Derek	Reg. No. 32,179
DiPietro, Mark J	Reg No 28,707	McDonald, Wendy M.	Reg. No. 32,427	Vietzke, Lance L.	Reg. No. 36,708
Edell, Robert T	Reg No 20,187	Mueller, Douglas P.	Reg. No. 30,300	Welter, Paul A.	Reg. No. 20,890
Farber, Michael B	Reg No 32,612	Nelson, Albin J.	Reg. No 28,650	Williams, Douglas J.	Reg. No. 27,054
Fauver, Cole M	Reg No 36,797			Wood, Gregory B.	Reg. No. 28,133

I hereby authorize them to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/organization/who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct Merchant & Gould to the contrary.

Please direct all correspondence in this case to Merchant, Gould, Smith, Edell, Welter & Schmidt at the address indicated below (or if no address is specified, the first address):

■ 3100 Norwest Center, Minneapolis, MN 55402-4131
Telephone No. (612) 332-5300

☐ 1000 Norwest Center, St. Paul, MN 55101-2701
Telephone No. (612) 298-1055

☐ Suite 400, 11150 Santa Monica Boulevard, Los Angeles, CA 90025-3302
Telephone No. (310) 445-1140

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Insert FULL name(s) AND address(es) of actual inventor(s)

201	FULL NAME OF INVENTOR	FAMILY NAME: KOU	FIRST GIVEN NAME: CHIH	SECOND GIVEN NAME: HSIEN
	RESIDENCE & CITIZENSHIP	CITY: TAIPEI	STATE OR FOREIGN COUNTRY: TAIWAN, R.O.C.	COUNTRY OF CITIZENSHIP: R.O.C.
	POST OFFICE ADDRESS	POST OFFICE ADDRESS: 5F, NO. 29, LANE 95, YUNG-AN ST., SAN-HSIA, TAIPEI COUNTY, TAIWAN, R.O.C.	CITY	STATE & ZIP CODE/COUNTRY
202	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
203	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY

Each inventor must sign & date

Note: No legalization or other witness required

SIGNATURE OF INVENTOR 201	SIGNATURE OF INVENTOR 202	SIGNATURE OF INVENTOR 203
KUO CHIH HSIEN		
DATE: 01/29/1997	DATE	DATE

For Additional Inventors:

☐ Check box and attach sheet with same information, including date and signature.

Revised 12/09/94